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MODULE 1
PROBLEM SOLVING

Distance Learning

Alberta EDUCATION

STUDENT SUPPORT GUIDE

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Mathematics 8

Module 1: Problem Solving

STUDENT SUPPORT GUIDE

Note to the Parent or Guardian

This Mathematics 8 Student Support Guide contains answers to activities in the accompanying Module Booklets. It should be kept secure by the parent or guardian if the student is under 16 years of age. Younger students should not have access to this Guide except under supervision.

This Student Support Guide does not contain the answers to the accompanying Assignment Booklets. The Assignment Booklets will be graded by the student's distance education teacher.

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Student Support Guide
Module 1
Problem Solving
Alberta Distance Learning Centre
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COURSE INTRODUCTION

Foreward

Welcome to distance learning. You have chosen an alternate form of learning that allows your student greater freedom in some ways than traditional classroom learning. It also requires some discipline and motivation for your student to carry on without someone standing behind and pushing as a classroom teacher often does. For junior high students distance learning is generally more effective if there is a learning facilitator. A parent or guardian of a student studying at home can be this person. As the learning facilitator you will have to help motivate and discipline your distance learning student.

This guide has been developed to assist you. It begins by familiarizing you with the process of learning at a distance. You will learn what is expected of a learning facilitator, how the course is set up, and how to help your student complete the course successfully. This guide contains guidance and answers to the activities your student is expected to do. Begin by reading the introductory material in this guide.

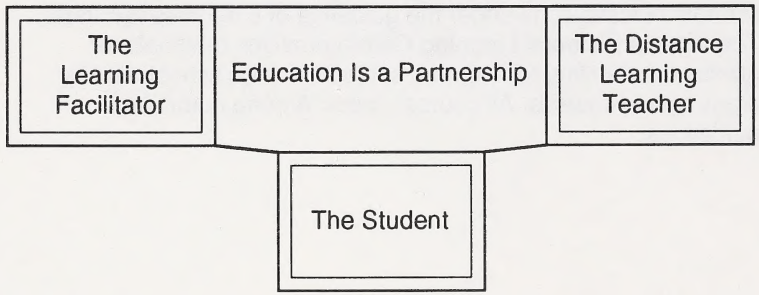
Distance Learning

The Role of the Learning Facilitator

As the learning facilitator you have a key role in determining the success your student has taking this course. Students need encouragement and the confidence of knowing that the course is important to their future.

You are expected to perform the following duties:

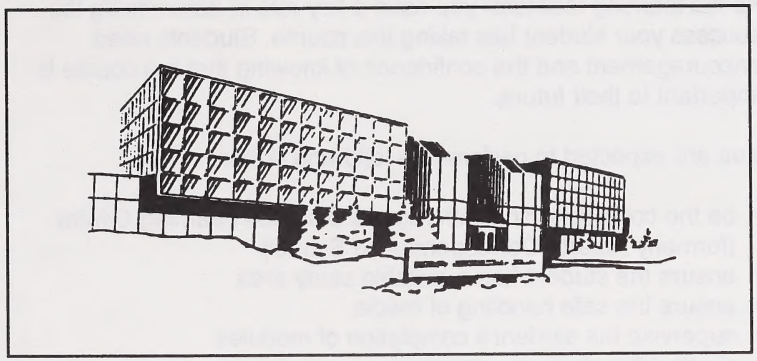
- be the contact person with Alberta Distance Learning Centre (formerly Alberta Correspondence School)
- ensure the student has a suitable study area
- ensure the safe handling of media
- supervise the student's completion of modules
- monitor the student's progress
- provide the student with encouragement
- check the student's work, or supervise the student's checking of the activities
- supervise the submission of assignments



The Alberta Distance Learning Centre

The Alberta Distance Learning Centre helps those who want to learn at a distance.

The Alberta Distance Learning Centre



The Alberta Distance Learning Centre is a branch of Alberta Education. It helps educate approximately 40 000 students a year from all parts of Alberta, the rest of Canada, and all over the world. Not all these students study on their own. Some students use distance learning courses to work at their own pace but work in schools or institutions under the guidance of a learning facilitator. The Alberta Distance Learning Centre provides materials for grades one to nine, for the core subjects in high school, and for many option courses. All courses follow Alberta curriculum guidelines.

The building, located in Barrhead, Alberta is about 6 500 m^2. Barrhead is located 120 km northwest of Edmonton. It contains a modern printing and typography unit, an instructional design unit, a teaching unit, a shipping and mailing unit with its own postal code, and a student services unit. The staff numbers about 200. Some teaching staff work in their homes on a contract basis.

How the Assignments Are Processed

1. Your student's assignments are received at the Mailing Department and sent to the Recording Department.

2. At the Recording Department materials are separated and labels are checked to see that they are correct. Assignments are sorted into elementary, junior high, and senior high subject areas.

3. All assignments and tests are entered into the computer.

4. Depending on the teacher to whom the student is assigned, the student's assignments come to the in-house teachers at the Alberta Distance Learning Centre or go to the contract teachers who work at home.

5. Corrected assignments are returned to the Recording Department. The marks are entered into the computer.

6. The assignments are put into envelopes and mailed back to the students.

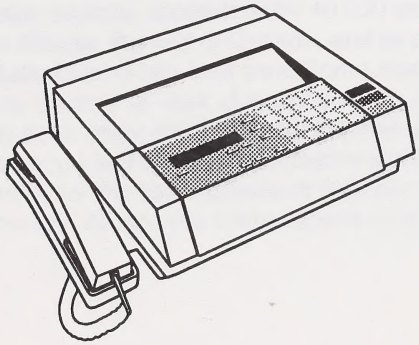
> It is important to label your materials carefully so that they are not lost in the masses of paper that are sent to the centre.

How to Make Contact

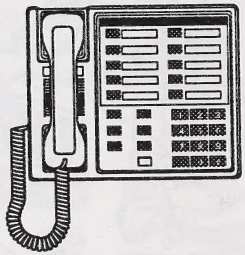
As the learning facilitator, one of your important roles is to be the contact person with the Alberta Distance Learning Centre. Staff members at the Alberta Distance Learning Centre may need to contact you from time to time. Also, it may be necessary for you to contact us. If you need help or information, you may contact the Alberta Distance Learning Centre in one of four ways.

1. You may write us a letter to be mailed or faxed. The fax number is 674-6588.

Alberta Distance Learning
Centre
Box 4000
Barrhead, Alberta
T0G 2P0



2. You may call the Alberta Distance Learning Centre.



- If you live in the Barrhead area, call 674-5333.
- If you live in other parts of Alberta, you may phone using the Government RITE System. Dial the number of the RITE Operator under your local Government of Alberta listings and ask for the Alberta Distance Learning Centre (674-5333).
- If you live in an area of Alberta not serviced by the RITE System, simply dial "0" and ask for "ZENITH 22333"; then ask for the Alberta Distance Learning Centre.

When you are concerned about course content, ask for a specific teacher or a particular department. When you are concerned about registrations, testing or accounts, ask for Student Services.

Student

Student

Teacher

Student Services

Teacher

3. Come to visit the Alberta Distance Learning Centre in Barrhead (120 km northwest of Edmonton). Office hours are 8:15 am to 4:30 pm, Monday to Friday, except on statutory holidays. Phone ahead if you wish to see a particular person.

4. Contact the Edmonton Study Centre. If you live in the Edmonton area, you may contact the Edmonton Study Centre for information, some supplies, and as a drop-off point for assignments. The hours are 8:15 am to 4:30 pm, Monday to Friday. Telephone 427-2766.

Edmonton Study Centre
9th Floor
Harley Court
10045-111 Street
Edmonton, Alberta

All About Mathematics 8

Rationale and Philosophy

This learning package was designed and developed using these assumptions.

- It is important to enhance a student's ability to solve problems.
- In learning new concepts students need to progress in stages from concrete, through pictorial, to symbolic.
- Students have varying learning styles and abilities which must be recognized.
- Calculators and computers are tools with which students must become familiar in order to function effectively in this technological age.
- Students need opportunities to practise new skills and to maintain previously developed skills.
- The progress students make in meeting mathematical objectives should be evaluated using both formal and informal methods.

Goals

The goals of this learning package are to enable students to do the following.

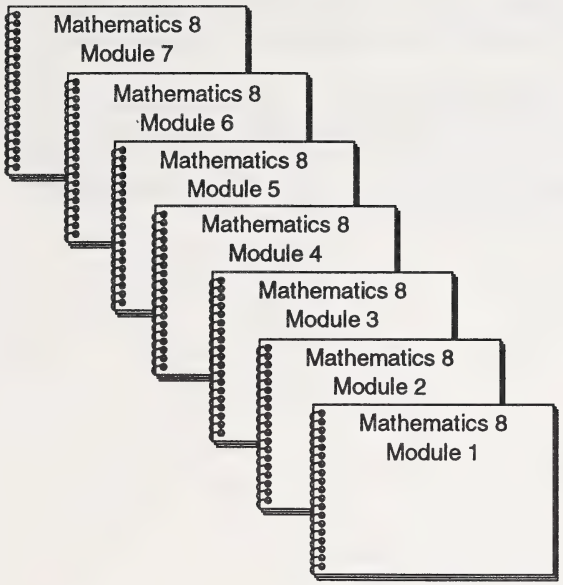
- to grow in their capability to solve problems
- to use mathematics as a tool in the pursuit of personal goals and aspirations
- to develop good self-concepts and positive attitudes towards mathematics and lifelong learning

Course Materials

This new learning package involves many other components in addition to the Student Support Guide.

Module Booklets

The print components in Mathematics 8 involve seven module booklets.



The structure of the modules in Mathematics 8 follows a systematic design.

Table of Contents

Module Introduction 1
Section 1 1
Section 2 5
Module Conclusion 50
Appendix 51

The Module Introduction gives an overview of the module and an evaluation statement.

The body of the module is made up of closely related sections. The number of sections will vary from module to module, but each section contains student activities that develop strategies, knowledge, and skills centred around a theme.

The Module Conclusion focuses on the main ideas that the student has learned. The Appendix includes a glossary and may include pull-out sheets.

Each section begins with a box entitled "What Lies Ahead." This box focuses the student on what skills and terms the student is expected to learn.

Most sections have a wide variety of activities:

- **Listening**, **Reading**, and **Video Activities** guide the student through the development of various concepts.
- **Introductory Activities** prepare the student for the section.
- **Practice Activities** give the student practice doing routine questions similar to those in the examples.
- **Extra Practice** gives the student who has experienced difficulty with the Practice Activities additional practice. Often a computer drill and instruction is included as an option.
- **Concluding Activities** give the student non-routine problems, computer games, and other enrichment activities.

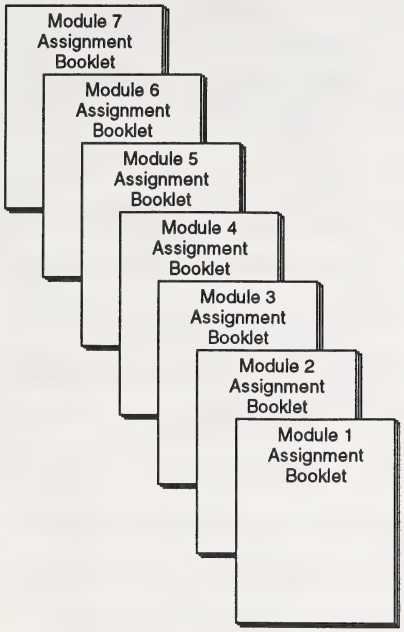
The student is not expected to do all the activities in the module booklet. You should help the student decide which activities are appropriate for his or her level of understanding and learning style preferences.

When terms are introduced in a course, it is important that the student understands that the terms are new, and that he or she reads carefully to fully understand what they mean. The course has been designed so that new terms are given special attention. Most often, they are **defined** within the sentence or paragraph. A special Glossary is also included at the beginning of the Appendix in each module booklet. As you supervise the student, make sure he or she knows what the new terms are and what they mean.

When skills are introduced in a course, it is important that specific examples are provided. This course has been designed so that new skills are fully explained with examples. As you supervise the student, you should ensure that the student carefully studies the notes and examples, and learns these skills.

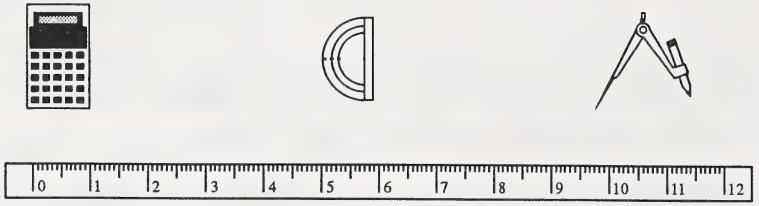
Assignment Booklets

Accompanying each module is an assignment booklet. The student's mark for each module will be determined how the assignments are completed in the assignment booklet. If they are having difficulties, they should go back and review the appropriate section in the module booklet.


Module 7 Assignment Booklet
Module 6 Assignment Booklet
Module 5 Assignment Booklet
Module 4 Assignment Booklet
Module 3 Assignment Booklet
Module 2 Assignment Booklet
Module 1 Assignment Booklet

When the student has completed the assignment booklet, it should be promptly mailed for corrections to the Alberta Distance Learning Centre. While you are waiting for feedback from the teacher, you are encouraged to have the student start the next module.

Mathematical Tools

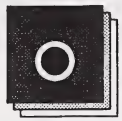


The learning package refers to mathematics tools which are required for some activities. These must be purchased by the student.

Media

Course Audiocassette Providing General Teacher Guidance

Videocassette



Computer Disk

Special audiocassettes feature a teacher guiding the student through the course. The appearance of the teacher icon reminds students that there is this additional help available.

The learning package also includes reference to other media. Pathways have been developed so students can use a variety of media to learn what is important. These different routes have been included to guide different learners. Wherever videos or computer activities have been included, a print pathway is also available. This way, if the media isn't available or desired, a student can follow the print pathway and still successfully complete the course.

Contact your local school authorities or the Alberta Distance Learning Centre to discuss how to obtain the video and computer programs cited in this course.

Summary of Materials

Materials Supplied	**Courseware*** Student Support Guide (7) Module Booklets (7) Assignment Booklets (7) Audiocassettes
Materials Required	**Tools** calculator geometry set scissors **Media** audiocassette player
Optional Materials	**Media**** videocassette player Apple™ or compatible computer videocassettes computer program

*When you receive your course materials, you should take time to look carefully at what you received. Take note that **your entire course may not be sent at one time**. If you received the wrong course or your course is defective in any way, notify the Student Services Department of the Alberta Distance Learning Centre immediately.

**A list of video and computer programs used in the course is listed on the following page.

Video Programs

THINKABOUT: Find Your Guide (AIT)

THINKABOUT: There Are Many Ways to Go (AIT)

MATH WORKS: Identifying the Problem (AIT)

MATH WORKS: Simplifying the Problem (AIT)

MATH WORKS: Adding and Subtracting Fractions and Mixed Numbers with Like Denominators (AIT)

MATH WORKS: Adding and Subtracting Fractions and Mixed Numbers with Unlike Denominators (AIT)

MATH WORKS: Using Mental Computation for Addition (AIT)

MATH WORKS: Using Mental Computation for Subtraction (AIT)

MATH WORKS: Sampling (AIT)

SOLVE IT: Guess-Check-Revise (AIT)

SOLVE IT: Solving a Simpler Problem (AIT)

SOLVE IT: Multiplication with Fractions and Mixed Numbers (AIT)

SOLVE IT: The Meaning of Percent (AIT)

SOLVE IT: Sampling (AIT)

MATHWAYS: Volume (kinetic)

MATH MOVES: Number Theory (ACCESS Network)

MATH MOVES: Adding and Subtracting Fractions (ACCESS Network)

MATH MOVES: Multiplying and Dividing Fractions (ACCESS Network)

MATH MOVES: Integers (ACCESS Network)

MATH MOVES: Equations – Solving with One Step (ACCESS Network)

MATH MOVES: Equations – Solving with More Than One Step (ACCESS Network)

Computer Programs

Problem-Solving Strategies (MECC)

Number Munchers (MECC)

Conquering Whole Numbers (MECC)

Conquering Fractions (MECC)

Math Strategies: Problem Solving (SRA)

Computer Drill and Instruction: Mathematics, Level D (SRA)

Integers Fast Facts (EduSoft)

Problem Solving in Algebra (Britannica)

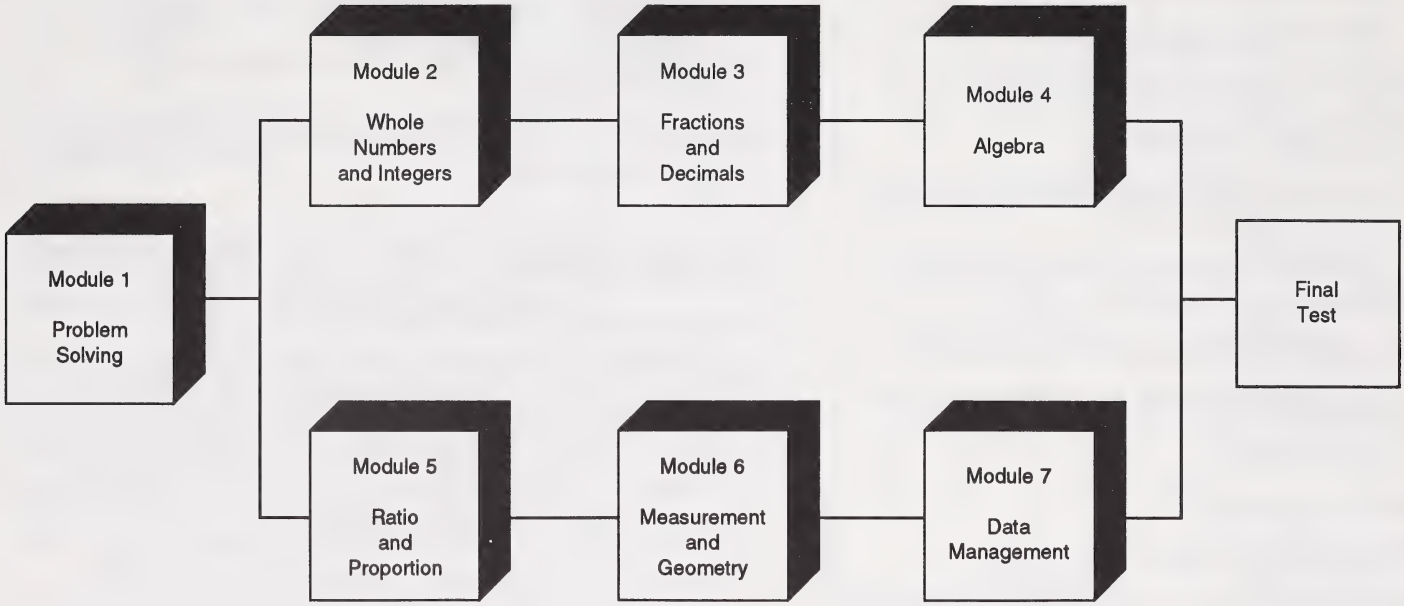
Mathematics Activities Courseware 6, 7, 8 (Houghton Mifflin)

Geometric Concepts: Perimeter (Jostens Learning Systems)

Geometric Concepts: Area (Jostens Learning Systems)

LOGO

Course Structure



It is recommended that the student start with Module 1 because this module includes basic introductory information.

It is further recommended that students do the modules in order because each module requires skills introduced in previous modules.

Evaluation

There are two kinds of evaluation used in the course. These are informal and formal. As the learning facilitator you will take part in the informal evaluation.

Informal Evaluation

The course contains two types of activities. In the module booklets there are learning activities that include basic practice and questions that help guide the students to a better understanding. It is important that these activities are corrected as soon as possible so the students get immediate feedback to confirm and clarify their understanding before they go on. At the junior-high level, **checking the activities and discussing the results is one of the most important duties of the learning facilitator.**

When the student has completed an activity, you should skim over it before checking it to be sure the student has spent enough time and effort on the activity.

When checking a student's work, first focus on the work the student has done correctly and then comment on his or her effort. Then, if necessary, spend time clearing up any misunderstandings.

Following are a few suggestions that have proved to be constructive ways of handling errors. First, stop to consider why there are errors. Ask yourself the following questions:

- Is the student repeatedly making the same mistakes or do the errors appear to be random?
- Do the errors appear to be the result of carelessness?

If the student is repeatedly making the same mistakes, you may need to read through that section and explain the math ideas in your words.

If the error is random and does not have a serious impact, it may be ignored.

If the error appears to be careless you may need to

- check to see if the student understands the directions
- relate the activity where the errors occur to some meaningful aspect of the student's life
- discuss the information with the student
- have the student slow down
- give the student a rest

Always instruct the student to correct errors. The module booklet becomes an important reference when doing the assignments, and it is essential that it is accurate.

Remember, it is very important that students not only learn from their corrections, but they must realize that making mistakes is a normal part of learning.

You may decide to let the student check some of the activities after you have ensured that the student has spent enough time and effort on the activity. Make sure that you see the activity with its corrections before letting the student go any further in the module booklet.

It is of little value to students if you do their work. How many items are incorrect is not the most important thing, but how the mistakes are handled. Sometimes it is easier when you are guiding the student to put in the answers, but it does not help the student

learn the concept. Activities with examples have been included with the student modules to provide guidance for the students.

Formal Evaluation

Formal Evaluation is based on the assignments in the assignment booklet and the final test. These are marked by a distance learning teacher.

There is an assignment booklet for each module in the course. The assignments are based on the work the student has completed in the module. The student may refer to the module booklet while completing the assignments but should complete the module assignment independently and should not receive help. The module mark is determined by how well the student does on the module assignment.

Module Evaluation

Each module submitted to the distance learning teacher is evaluated on the basis of the student's demonstrated understanding of the concepts taught in that module, completeness of work, neatness, and legibility. A letter grading is then assigned which follows the scale of percentage or performance equivalencies below.

A	80% – 100%	Outstanding
B	65% – 79%	Good
C	50% – 64%	Satisfactory
D	40% – 49%	Needs Improvement
F	0% – 39%	Unsatisfactory
I	Incomplete	Follow distance learning teacher's directions and return entire module in order to receive a grading.
R	Repeat	

Final Test

Mathematics 8, being a core subject in junior high, requires the writing of a final examination which must be supervised by a responsible adult. (See the *Handbook for Junior High Students* for details.) This supervised test must be written before the student's registration expires. The test will not be returned to the student. In order to receive a passing grade in Mathematics 8, the student must score a "D" or better on the final exam and have an overall standing of "C" or better for the entire course.

Final Mark

The final mark is determined by how well the student does on all modules and the final test. The test will make up 40% of the final mark in Mathematics 8. The other 60% will be based on the module assignments.

Below is a breakdown of how this course will be evaluated.

Module 1:	5%
Module 2:	10%
Module 3:	10%
Module 4:	10%
Module 5:	10%
Module 6:	10%
Module 7:	5%
Final Test:	40%

If the student is dissatisfied with his or her mark, you may request an appeal paper. Such requests should be made within 30 days.

Report Cards

Report cards are mailed twice a year – in October and in February – to all non-school students under 16 years of age. The principal or superintendent is also sent a copy of the report card. This card shows the number of modules completed in the course, the average grading per module, and the final mark received for the completed course.

Starting Out Right

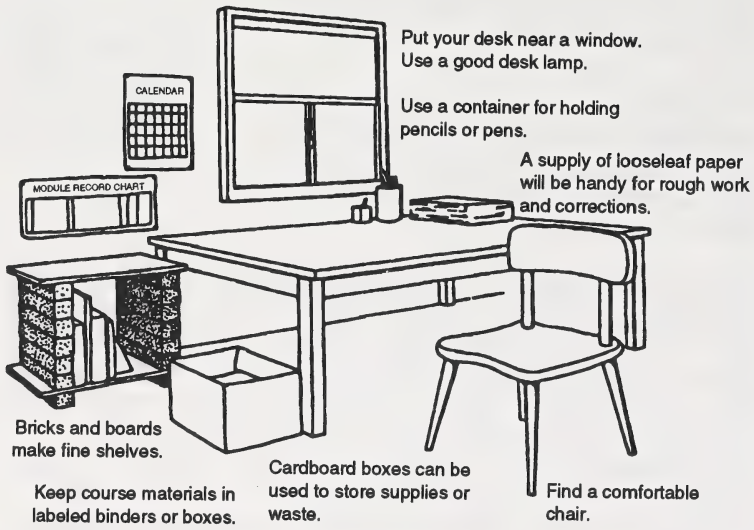
Proper planning, organization, and good study habits will help your student to succeed in his or her studies. This section of the guide will give you and your student some idea of how to use time efficiently so that the student can achieve his or her goals. If you are new to distance learning, both you and the student will probably benefit from the tips on time management and study habits in this section.

Setting Up Shop

Probably one of the best ways to ensure success in distance learning is to establish a study corner. This is a quiet, well-lit area where the student can leave books, paper, and supplies. It should be an area where there is no telephone, no radio, no television, and no people doing things that might cause distraction. Find the best place for studying in your home. A comfortable chair and sufficient work space, usually a table or desk, are essential. All necessary supplies, tools, materials, and books must be gathered. The work area could contain exercise equipment like barbells or even an exercise bike. When your student begins to feel sluggish, encourage a ten minute exercise break.

You may also wish to set up a media area. This can include a video player and/or a computer.

The following diagram may be helpful for organizing your study area.


CALENDAR
MODULE RECORD CHART
Put your desk near a window. Use a good desk lamp.
Use a container for holding pencils or pens.
A supply of looseleaf paper will be handy for rough work and corrections.
Bricks and boards make fine shelves.
Keep course materials in labeled binders or boxes.
Cardboard boxes can be used to store supplies or waste.
Find a comfortable chair.

Students should keep these course related articles in their work area.

pens	pencil crayons	return envelopes
pencils	extra paper	module materials
glue	geometry set	audiocassette player
tape	scissors	ADLC phone number
eraser	calculator	timetable

An efficient student work place will help learning.

Time Management

There are so many demands on our time nowadays that we really must make the effort to organize our work and our activities. This organization or planning is called time management.

With distance learning, it is a necessity that the student plans his or her schedule. Your duty is to ensure that the student does some advance planning. Check the final plans to see if they are realistic.

Only you and the student know exactly how much time is available for completing a course. It does not matter too much what time of day the student does course work. This varies with the individual's situation. Distance education is flexible. To decide exactly how much time the student must make for his or her studies, the student must set priorities. Together you must decide exactly when you wish to have the course completed. You must take into account time worked away from home, time needed for chores, and time needed for recreation and relaxation when you make this estimate.

The minimum time requirement for Mathematics 8 is 100 hours. Usually this time is spread over a school year of about 40 weeks.

The following are average times to complete Mathematics 8 in 40 weeks.

Module 1: 2 weeks
Module 2: 9 weeks
Module 3: 7 weeks
Module 4: 5 weeks
Module 5: 5 weeks
Module 6: 9 weeks
Module 7: 3 weeks

You may wish to use these times as a guide.

Making a Weekly Plan

Discuss with your student the importance of weekly planning.

People who write for a living always have deadlines to meet. They cannot wait for inspiration. They discipline themselves to sit down and write for a number of hours every day. Whether they like it or not, they stick to a schedule. This determines success.

Work with your student to

- keep track of what he or she usually does in a typical week
- plan the studies he or she can do in a typical week
- keep a list of what he or she must do each day and cross off each study task as it is completed
- find his or her own best time to study
- set deadlines and stick to them
- not dwell on failures and get back on schedule

Sample Weekly Timetable

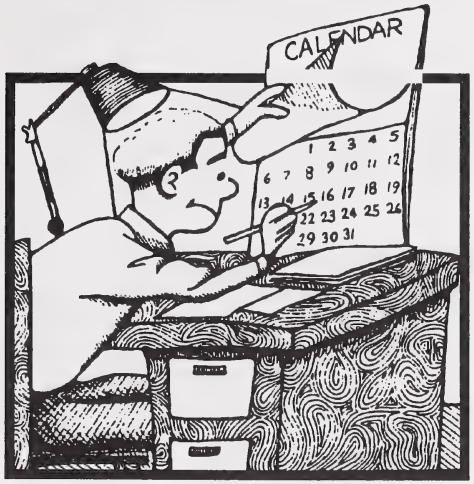
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Note

Begin the timetable when the student wakes up, and end when the student goes to bed. Write in every hour.

Making a Monthly Plan

The next step is planning a monthly schedule with your student. The student should block off the days he or she knows are not available for studying.



- Count the days that are available between the start of the course and the desired finishing date.
- Allow time for review.
- Count the number of sections or modules that must be completed.
- Estimate how many days are available to complete each section and each module.
- Make a monthly plan like the one in the next column.

Sample Monthly Timetable

September

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	~~2~~
~~3~~	~~4~~	5	6	7	8	9
10	11	12	~~13~~	14	15	~~16~~
17	18	19	20	21	22	23
~~24~~	25	26	27	~~28~~	~~29~~	30
Total Work Days Available for Study						
Goal :						

Note

It is not wise to plan to use 100% of the student's time. Allow for interruptions and sections or modules taking longer than expected.

Making a Course Plan

When you both have an idea of how much time is available every day, week, and month, look at a plan for completing the course(s) that the student is studying.

Modify these plans as circumstances change. Be flexible, but do not procrastinate.

Our experience has shown that a planned approach to module completion is far better than the "hit and miss" method of completing modules now and then, as you feel like it.

The student needs determination and perseverence to continue working independently. The student also needs your positive support and interest to keep motivated.

Sample Course Timetable

Course Name _____ Date of Starting _____

Planned Completion Date _____ Actual Completion Date _____

Module	Planned Completion Date	Actual Completion Date	Date Mailed	Date Returned

Procedures

Supervising the Completion of Modules

Try to ensure that the student is following the timetable established as closely as possible and that the target dates for module completions are being met. If, for some reason, students miss time from studying, they should spend additional time during the evenings or weekends so they will complete their courses within the desired time limits.

When the student has completed the learning activities, you should allow the student to do the assignment in the assignment booklet. Afterwards you should go over the assignment to ensure the student has spent enough time on the assignment. When the entire assignment booklet is done satisfactorily, it should be promptly mailed for corrections to the Alberta Distance Learning Centre. While you are waiting for feedback from the teacher, you are encouraged to have the student start the next module.

How to Send in Assignments

Assignment booklets, along with any other requested materials, should be submitted to the Alberta Distance Learning Centre as soon as possible after the completion of each module in order to obtain speedy, regular evaluation and feedback. The student can proceed with the next module while waiting for the return of the assignment booklet.

Please ensure that your student's file number is on all assignments, tapes, and disks sent to the Alberta Distance Learning Centre.

Report any change of address immediately. If a change is not reported, it is impossible for the school to forward information, letters, or test applications.

Mailing

The student is required to pay the postage on everything sent or returned to the Alberta Distance Learning Centre. To speed up handling, first class postage is recommended on all assignments submitted.

The student is expected to perform his or her work and to correspond with teachers and administrative staff in an appropriate manner. The Alberta Distance Learning Centre reserves the right to cancel, without refund, the course of any student whose conduct is unbecoming.

Do not enclose letters concerning fees, guidance, additional courses, final tests, or general inquiries with assignments. Send these by separate mail to speed their handling and to avoid their misplacement.

Dropping Off Assignment Booklets

You may drop off assignments at the Edmonton Study Centre or in Barrhead at the Alberta Distance Learning Centre.

Faxing Assignments

Be sure the cover of your assignment booklet is filled in correctly with the proper label attached.

Check to see that all response pages have been completed as directed.

Check to see that all faxing boxes located at the bottom of each response page have been clearly filled out.

Costs for faxing assignments to the Alberta Distance Learning Centre are the responsibility of the student.

Monitoring the Student's Progress

Review returned assignments carefully with the student, noting the marks, teacher's corrections, and comments. The teacher may suggest that you make certain choices of activities in future modules to help you practise needed skills. Your teacher may also ask you to complete skill activities which are either included in the course or sent to you by the teacher. Returned assignments should be kept for future review and study.

An interim report card will be mailed at the beginning of February, and a year-end report card will be mailed at the end of September.

Students are encouraged to complete their program of studies by the end of June of the year in which they register; however, students may continue over the summer if they desire. If students are not finished with their courses by the year end, which is August 31, the registration may be extended for another year, but the superintendent should be made aware of this when a student lives in a school division, county, or district.

Students should be able to complete the full program in 10 months if effective instruction is taking place and there are no special circumstances which may influence the student's progress.

What to Do About the Final Test

When the student has nearly finished the course, you will have to help the student select an appropriate test supervisor and indicate your selection on the Supervisor Application Form. This form is mailed to the students when they complete Module 3. Guidelines for the selection of the supervisor accompany the application form.

After the supervisor for the final test has been selected, you should help the student arrange a time with the supervisor for the administration of the test. The test will be sent to the supervisor when all modules have been completed.

Providing the Student with Encouragement

The biggest problem faced by the students who select to study by distance education is that they may lose their motivation and discontinue their studies, or they take excessive time to complete their courses in an appropriate time period. A period of ten months is recommended although individual circumstances may require more flexibility.

Basic Study Tips

Planning and good study habits will help the student to succeed in distance learning. Here is a short list of important tips to discuss with the student.

- Work together to make a course plan and weekly timetable, and follow them as closely as you can.
- Remember that mornings are usually better for concentration. Learning styles may vary from student to student.
- Check to see that all necessary materials and supplies are close by before starting work.
- Have the student take relaxation or exercise breaks between study periods.
- Be sure that the student completes all activities carefully and reviews corrections before moving to other assignments.
- Ensure that the student understands and follows directions carefully when completing activities. If the student is unclear about what to do, the student should then restart by rereading the directions. If there are still problems, the student should discuss the activity with the learning facilitator. Sometimes reviewing the previous activities is helpful.
- Ensure that the student always supplies his or her own written responses.
- Encourage the student to switch from a subject or activity before it becomes stale. If the student is working regularly and truly concentrating, one or two hours on one subject should be enough at one sitting.
- Have the student be sure that writing is neat, legible, and complete.
- Encourage the students to discuss their reading and writing with you.

Study Skills Videos

Here is a list of videos that may be helpful in developing good study skills.

THINKABOUT: You Can Remember (AIT)

THINKABOUT: Practice for Success (AIT)

THINKABOUT: Calm Your Jitters (AIT)

THINKABOUT: Get Ahead with Goals (AIT)

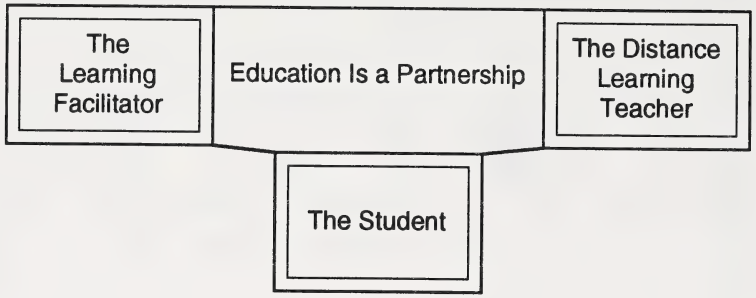
THINKABOUT: Make a Deal with Yourself (AIT)

THINKABOUT: There Are Ways to Remember (AIT)

If your student is on a home-schooling contract, you should contact your home-schooling coordinator or Superintendent to discuss the availability of these video programs from the media resource centre in your school division.

Summary

This introductory section of the Student Support Guide has been developed to assist you in your role as learning facilitator. Develop a routine with your student and a good working relationship. Remember that education is a partnership.



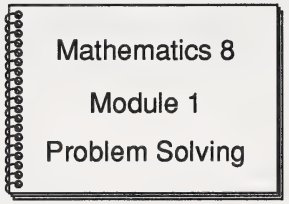
MODULE INTRODUCTION

What Lies Ahead

In this section the student will preview Module 1 and learn how it will be evaluated.

Gathering Materials

For this section the student will need these items.



Guiding the Student

- You may wish to have the students read the Welcome and encourage the students to listen to the companion audiocassette for guidance, or you may wish to guide the students yourself.
- Discuss the learning process, time management, and evaluation with the students. Suggestions are given on the next page.

The Learning Process

Each section of Module 1 deals with a different aspect of problem solving. Students will learn about this approach by reading notes in the module booklet or by viewing a video program. Afterwards the student will be given different problems to practice. Sometimes there is a computer alternative for students who have Apple or other compatible computers. When the student completes a practice activity, you will help him or her check the answers and correct any errors. Emphasize to the student that the thinking process is more important than the answer. Encourage the student to explain how the answer was discovered.

Time Management

Decide how long the student will need to complete the module. An average student should spend about 2 weeks of a 40-week year to complete the module. It is recommended that students spend no more than 1 hour at a time doing mathematics.

Evaluation

Explain to the students how the module will be evaluated.

Additional Suggestions

The authors of this learning package recommend that you create a positive classroom atmosphere that allows students to express their own ideas and use individual approaches in problem solving. In order to develop this atmosphere you should do the following.

- Be supportive and encourage risk taking in finding solutions.
- Encourage students to use creative approaches.
- Be willing to accept unconventional solutions, more than one solution, or no solution (where appropriate).
- Challenge students to think critically and justify strategies and solutions.
- Be enthusiastic and capable of recognizing the students' willingness and perseverence to solve problems.

The authors of this learning package further recommend that group work be used in problem solving. "A student in a group deals with ideas and questions from other members of the group and this may help each student progress in developing problem-solving strategies."[1]

The authors of this courseware also encourage the use of calculators in problem solving. "...time spent on tedious calculations is decreased and feedback on strategies is faster. Numbers from realistic and relevant situations are less imposing if calculators are used."[2]

In order to help students improve their problem-solving skills, it is also recommended that you observe and question students while they are solving problems.

Below are some of the factors you should consider:

- willingness to attempt problems
- use of a systematic approach
- selection of appropriate strategies
- efficiency in selection of appropriate strategies
- logical justification of strategies and solutions
- perseverence
- growth of confidence in problem-solving ability
- transfer of problem-solving skills to situations other than mathematics

Note

Evaluation techniques and instruments for problem solving are suggested in *Problem Solving Challenge for Mathematics* (Alberta Education, 1985) pp. 7, 8, 52-56.

After your students have been introduced to problem solving in Module 1, they will be given further problem-solving opportunities in other modules.

You may also wish to supplement the problems in the learning package with those from other books. (For example, many teachers like to have a problem of the week.)

[1–2]Alberta Education for the excerpts from the *Teachers Resource Manual for Junior High Mathematics.*

THE FOUR-STAGE PROCESS OF PROBLEM SOLVING

What Lies Ahead

In this section the student will learn the four stages of problem solving.

- understanding the problem
- developing a plan
- trying the plan
- looking back

Gathering Materials

For this section the student will need these items.

Mathematics 8
Module 1
Problem Solving

(optional)

THINKABOUT: Find Your Guide
(Agency for Instructional Television)

Guiding the Student

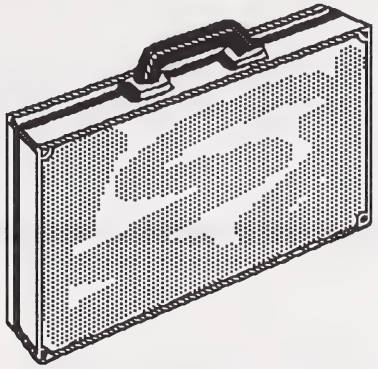
- Emphasize to the students the goal of the section.
- Help the students check their answers to the Practice Activities and correct any errors.

Practice Activities

1. Name the four stages in the process of problem solving.

2. Explain how you would solve each of these problems.

   a. If a briefcase was packed with $10 bills, what would be the total value of the money?

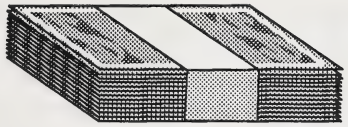


Suggested Answers

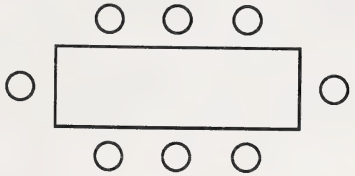
1. The four stages of problem solving are
   - understanding the problem
   - developing a plan
   - trying the plan
   - looking back

2. a. Answers will vary. A possible method is to use a briefcase and stacks of paper to represent stacks of bills. The students can then estimate the number of bills. The value of the money can be discovered by multiplying the number of bills by 10.

b. How would you cash a $33 cheque with six bills if you cannot use $1 bills?

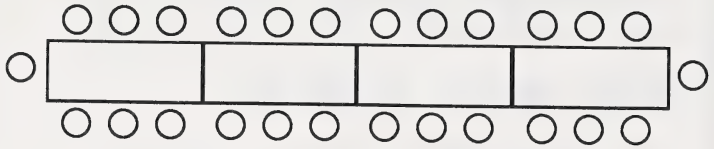


c. A table in a restaurant seats eight people—three at each long side and one person at each end. How many people can be seated if four of these tables are pushed together into one long row?



b. Through trial and error the student will discover that the cheque can be cashed using four $2 bills, one $5 bill, and one $20 bill.

c. Through using models or a diagram the student will discover the seating arrangement will look like this:



26 people can be seated if four tables are pushed together.

3. Jackie had the following problem to solve.

   Carlos earns $12.40 each week for his work stocking grocery shelves. He also receives an allowance of $4.25 each week for helping with chores around the house. How much money does Carlos make in a year?

   Jackie calculated that Carlos earns $8500 in a year. Is her answer reasonable? Why or why not?

4. Frank had this problem to solve.

   What digit goes in the , , and to make the following equation true?

   Frank solved the problem this way.

   $33 \times 11 = 363$

   Are there any other possible answers to the problem? If so, what are they?

3. Carlos earns $12.40 + 4.25 or $16.65.
   There are 52 weeks in a year.

   This is an estimate of the amount earned in a year:

   $$52 \times \$16.65 \doteq 50 \times \$20$$
   $$\doteq \$1000$$

   $$\$8500 > \$1000$$

   So, Jackie's calculations are not reasonable.

4. Other possible answers are given:

   $22 \times 11 = 242$
   $44 \times 11 = 484$

IDENTIFYING THE PROBLEM

What Lies Ahead

In this section the student will learn these skills.

- identifying the essential elements of a problem
- ignoring unnecessary details
- changing the setting of a problem to help understand the problem
- restating the problem in their own words

Gathering Materials

For this section the student will need these items.

Mathematics 8
Module 1
Problem Solving

MATH WORKS: Identifying the Problem (Agency for Instructional Television)

Guiding the Student

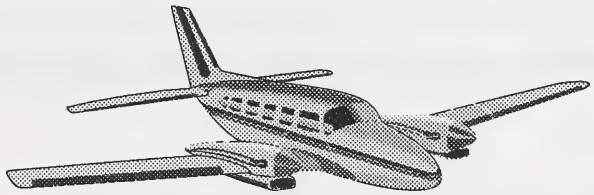
- Encourage the student to recognize the goal of the section.
- Help the students check their answers to the Practice Activities and correct any errors.

Practice Activities

1. Cross out the unnecessary details in the following problems and then restate the problems in your own words.

   a. Rock is working ~~very hard~~ to earn enough money to buy a ~~new~~ $425 bicycle. He gets paid $14 per week for babysitting ~~two hours on Thursday and five hours on Saturday~~. As well, he earns $20 per week for delivering newspapers ~~between 6:30 and 7:30 a.m. every morning~~. He also gets paid $5 ~~every Wednesday~~ for ~~spending $1\frac{1}{2}$~~ hours delivering ~~weekly advertising~~ flyers. For how many weeks will Rock have to work so that he can buy his new bicycle?

   b. A plane ~~leaves Vancouver at 7:30 a.m. and~~ arrives in Toronto at 12:00 noon Vancouver time. ~~It flies a distance of 3400 km at a cruising speed of 950 km/h~~. When it is 6:00 a.m. in Vancouver, it is 9:00 a.m. in Toronto. What time is it in Toronto when the plane lands?



Suggested Answers

1. a. Rock wants to buy a bicycle that costs $425. He earns $14 per week for babysitting, $20 per week for delivering papers, and $5 per week for delivering flyers. For how many weeks will Rock have to work before he can buy his bike?

   b. A plane arrives in Toronto at 12:00 noon Vancouver time. When it is 6:00 a.m. in Vancouver, it is 9:00 a.m. in Toronto. What time is it in Toronto when the plane lands?

2. Change the setting of the following problems.

a. A numismatist bought a rare coin for $30, sold it for $40, bought it back for $60, and sold it again for $70. How much money did the numismatist make or lose in buying and selling this coin?

b. Armond spent twice as much on shantung as he spent on chambray. If he spent $30 on chambray, how much did he spend on shantung?

2. a. Lisa bought a sweater for $30 and then sold it to a friend for $40. She bought the sweater back from her friend for $60 and sold it to another friend for $70. How much money did Lisa make or lose while buying and selling the sweater?

b. Randy's shirt cost twice as much as Cleo's shirt. If Cleo's shirt cost $30, how much did Randy's shirt cost?

REASONABLENESS OF ANSWERS

What Lies Ahead

In this section the student will learn these skills.

- estimating an answer
- determining if an answer is reasonable

Gathering Materials

For this section the student will need these items.

Mathematics 8
Module 1
Problem Solving

(optional)

SOLVE IT: Reasonableness of Answers (Agency for Instructional Television)

Guiding the Student

- Emphasize to the students the goal of the section.
- Help the students check their answers to the Practice Activities and correct any errors.

Practice Activities

For Questions 1 to 3, estimate the answers and then tell which of the provided answers is the most reasonable and explain why.

1. If a person walks 1 km, how many steps are taken?

   a. 25
   b. 100
   c. 2000

2. A hamburger patty has a mass of about 100 g. How much ground beef is needed if 25 people eat 2 hamburgers each?

   a. 5 kg
   b. 50 kg
   c. 500 kg

3. If you use 2 mL of toothpaste each time you brush your teeth (3 times a day), about how many weeks will it take to use up a 100-mL tube of toothpaste?

   a. 2 weeks
   b. 6 weeks
   c. 12 weeks

Suggested Answers

1. If you assume that the person will take 2 steps to cover 1 m, then 2000 steps will be required to cover 1000 m, which is equivalent to 1 km.

   c is the answer.

2. If 25 people could consume 50 patties, and each patty weighs 100 g, the total consumed will be 5000 g, which is equal to 5 kg.

   a is the answer.

3. If you use 6 mL of toothpaste each day, you will use 42 mL of toothpaste each week. 100 mL of toothpaste should last about 2 weeks.

   a is the answer.

For Questions 4 to 6, calculate the answers and then tell which of the provided answers is the most reasonable and explain why.

4. The 29 students in the seventh-grade class at the Willow Creek School are going on a field trip. If four students fit in each car, how many cars are needed?

   a. 7
   b. 1
   c. 7.25
   d. 8

5. Charlie's jazz band rehearsed a total of 29 hours in the last 4 days before the concert. If they spaced their rehearsals equally over the 4 days, how many hours did they practice each day?

   a. 7
   b. 1
   c. 7.25
   d. 8

6. Annette has collected 29 cassette tapes. She wants to arrange them in a box which will hold 4 tapes in each row. How many tapes will she put in the last row?

   a. 7
   b. 1
   c. 7.25
   d. 8

4. **d** is the answer.

   29 ÷ 4 = 7 R1

   If 7 cars are used, one student will be left behind. Since all 29 students must go, 8 cars must be used.

5. The answer is **c**.

   29 ÷ 4 = 7.25

   An exact answer is needed here. Fractions of an hour are possible.

6. The answer is **b**.

   29 ÷ 7 = 4 R1

   Only 1 tape is in the last row since 28 tapes are required to complete 7 rows.

For Questions 7 and 8, draw a picture to help you get a reasonable answer.

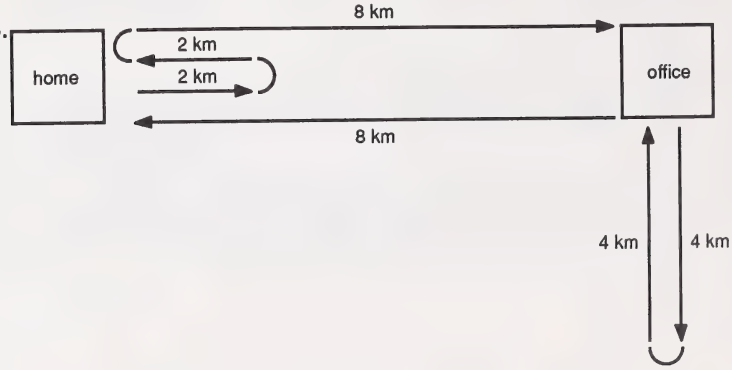
7. Nadine is building a dog run. She wants the run to be a rectangle with 6 upright posts on each short side and 10 upright posts on each long side. How many posts will she need?

8. Gail's office is 8 km from her home. Yesterday morning she drove 2 km before she realized she had forgotten her briefcase. She returned home to get her briefcase and then drove to her office. At noon Gail drove 4 km to run some errands. She then went back to the office for the rest of the afternoon. At the end of the day she drove straight home. How far did she drive yesterday?

7.

Number of posts needed = 6 + 8 + 6 + 8 = 28
Nadine will need 28 posts.

8.



Number of km = 2 + 2 + 8 + 4 + 4 + 8 = 28
Gail drove 28 km.

USING SKETCHES AND OBJECTS

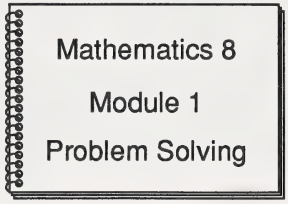
What Lies Ahead

In this section the student will learn these skills.

- using sketches to solve problems
- using objects to solve problems

Gathering Materials

For this section the student will need these items



MATH STRATEGIES: Solving Problems (SRA)

(optional)

Guiding the Student

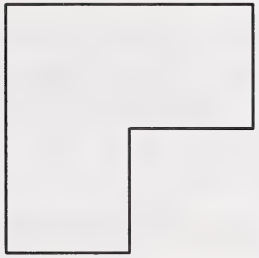
- Emphasize to the students the goal of the section.
- Help the students check the answers to the Practice Activities and correct any errors.

Practice Activities

1. Draw sketches to help you solve the following problems.

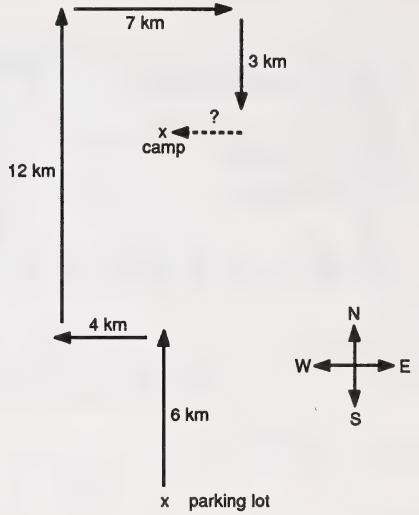
   a. A group of cross-country skiers intend to camp overnight at a site 15 km directly north of the parking lot. Starting at 8:00 a.m., they ski 6 km north, 4 km west, 12 km north, 7 km east, and 3 km south before stopping for lunch at noon. In what direction and how far must they ski after lunch to reach the campsite?

   b. A developer has bought this L-shaped piece of land. The developer wants to subdivide it into three congruent lots (lots that have the same shape and size). How can this be done?



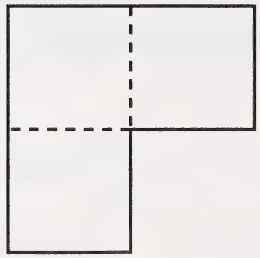
Suggested Answers

1. a.



They must ski 3 km west to reach the campsite.

b.



Three congruent lots can be made by subdividing as shown.

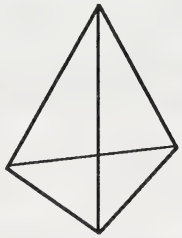
2. Use objects to help you solve the following problems.

   a. Assuming the length of a side of a triangle equals one toothpick, use six toothpicks to make four identical triangles.

   b. How would you fold this sheet of paper so that the numbered sections lie on top of one another in order from 1 to 8?

3	4	2	7
6	5	1	8

2. a. The solution is three dimensional. Only three of the toothpicks are on a flat surface.



   b. Step 1: Fold the sheet over like this so 6 lies on top of 5, and 3 lies on top of 4.

	2	7
	1	8

Step 2: Fold the sheet under like this. Now 6, 5, 4, and 3 are in order.

	1	8

Step 3: Fold the sheet under like this. Now 1, 2, 3, 4, 5, and 6 are in order.

1	8

Step 4: Fold the sheet under like this. Now all the numbers are in order.

1

Computer Alternative

3. Museum Trip

You'll need Disk 1 of *MATH STRATEGIES: Solving Problems* (SRA) to do this problem.

From the Chapter Menu choose "5 Using Models." Then choose "1 Museum Trip."

After you've read the problem, decide how much help you want.

Follow the directions on the screen.

Note: Whenever a smiling face appears, the computer stops. To make it continue press RETURN.

3. Computer corrected

4. Measuring Puzzle

You'll need Disk 1 of *MATH STRATEGIES: Solving Problems* (SRA) to do this problem.

From the Chapter Menu choose "5 Using Models." Then choose "Measuring Puzzle."

Complete as many Measuring Puzzles as you wish at the computer.

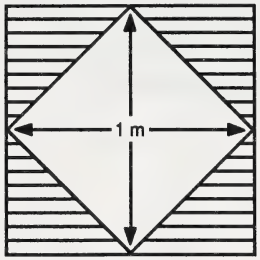
4. Computer corrected

Print Alternative

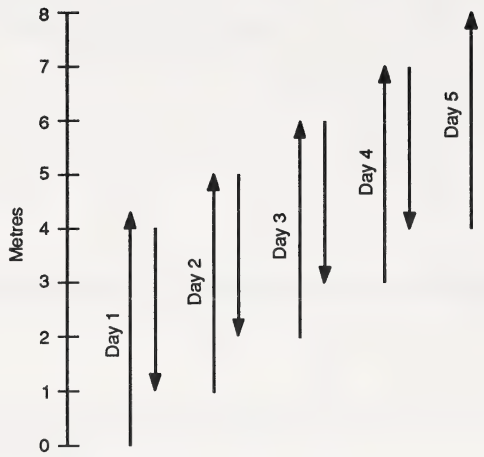
5. How can you cover half of a 1 m square window and still have a square opening that is 1 m across and 1 m from top to bottom?

6. A spider is at the bottom of a 8 m deep well. The spider climbs up 4 m each day, but slips back down 3 m each night. How many days will it take the spider to reach the top of the well?

5.



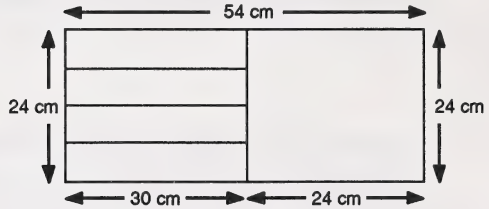
6.



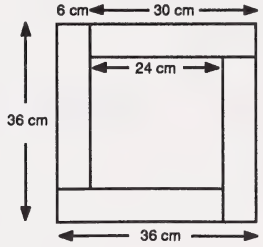
It will take 5 days to reach the top of the well.

7. Sandy wants to make a square breadboard from a rectangular piece of wood that measures 24 cm by 54 cm. She wants to use all the wood. What is the length of the side of the largest breadboard that Sandy can make?

7. The length of the largest breadboard that Sandy can make is 36 cm. It can be made by cutting the rectangular piece of wood this way



Assemble the breadboard this way:



The length of the largest breadboard Sandy can make is 36 cm.

MAKING LISTS AND TABLES

What Lies Ahead

In this section the student will learn these skills.

- making lists to solve problems
- making tables to solve problems

Gathering Materials

In this section the student will need these items.

Mathematics 8

Module 1

Problem Solving

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students check their answers to the Practice Acitivities and correct any errors.

Practice Activities

1. Kenza counted 29 wheels in a children's parade of bicycles and tricycles. If there were 12 children in the parade, how many tricycles were there?

2. Using only quarters, dimes, and nickels, how many ways can Philip pay for 95 cents worth of jelly beans?

Suggested Answers

1.

Number of Tricycles	1	2	3	4	5
Number of Bicycles	11	10	9	8	7
Number of Wheels	25	26	27	28	29

The table shows that there were 5 tricycles and 7 bicycles in the parade.

2.

Quarters	Dimes	Nickels
0	0	19
0	1	17
0	2	15
0	3	13
0	4	11
0	5	9
0	6	7
0	7	5
0	8	3

The chart is continued on the next page.

0	9	1
1	0	14
1	1	12
1	2	10
1	3	8
1	4	6
1	5	4
1	6	2
1	7	0
2	0	9
2	1	7
2	2	5
2	3	3
2	4	1
3	0	4
3	1	2
3	2	0

There are 26 ways that Philip can pay for 95 cents worth of jelly beans.

3. When choosing a new car at Magnificent Motors, the buyer may choose from 3 different models, 7 different colours, and either automatic or standard transmission. How many different car combinations are available?

3.

Model			Colour							Transmission	
1	2	3	1	2	3	4	5	6	7	Standard	Auto
✓			✓							✓	
✓			✓								✓
✓				✓						✓	
✓				✓							✓
✓					✓					✓	
✓					✓						✓
✓						✓				✓	
✓						✓					✓
✓							✓			✓	
✓							✓				✓
✓								✓		✓	
✓								✓			✓
✓									✓	✓	
✓									✓		✓

For Model 1 there are 14 different combinations. You can assume that Models 2 and 3 will also have 14 combinations each. Therefore, there should be 42 different car combinations in total.

4. Kimberley does housecleaning for her grandmother every Saturday. She earns 15 cents for each room that she vacuums and 25 cents for each room that she dusts. One day she did 16 jobs and was paid $3.30. How many rooms did she dust?

4.

Number of Rooms Vacuumed	1	2	3	4	5	6	7	8	9	10
Number of Rooms Dusted	15	14	13	12	11	10	9	8	7	6
Pay	3.90	3.80	3.70	3.60	3.50	3.40	3.30	3.20	3.10	3.00

Kimberley dusted 9 rooms.

GUESSING-CHECKING-REVISING

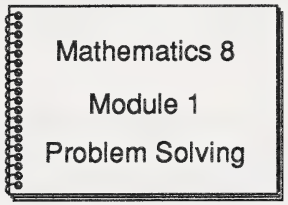
What Lies Ahead

In this section the student will learn these skills.

- solving problems by guessing, checking, and revising the answers
- organizing the guesses

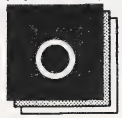
Gathering Materials

For this section the student will need these items.



SOLVE IT: Guess-Check-Revise (AIT)

(optional)



Disk A of *MAC7* (Houghton-Mifflin)

(optional)

Guiding the Student

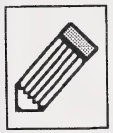
- Emphasize to the students the goal of this section.
- Help the students check their answers to the Practice Activities and correct any errors.

Practice Activities

Computer Alternative

1. Do the program "Guess and Test" on Disk A of *MAC 7* (Houghton-Mifflin).

Print Alternative



2. Carl opened his textbook and noticed that the product of the numbers of the two open pages was 2756. To which pages was the book opened?

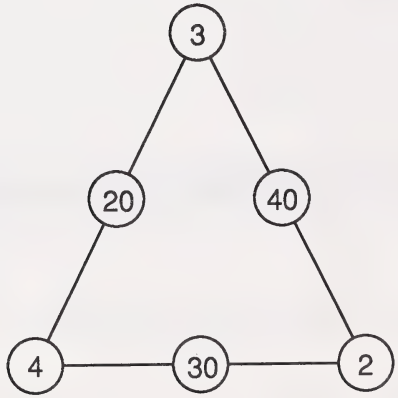
3. Place the numbers 2, 3, 4, 20, 30, and 40 in the circles so that the product of the three numbers on each side of the triangle is 240.

Suggested Answers

1. Computer corrected

2. The book was opened to pages 52 and 53.

3.



4. A physical education instructor spent \$231 for 16 new balls. If softballs costs \$4 each, footballs cost \$24 each, and soccer balls cost \$33 each, how many of each kind did the instructor buy?

Guess	Number of Softballs	Number of Footballs	Number of Soccer Balls	Test
1	3	4	9	$3 \times \$\ 4 = \$\ 12$ $4 \times \$24 = \$\ 96$ $9 \times \$33 = \$297$ Total 405
2	6 3	3	5	$5 \times \$33 = \$165$ $3 \times \$24 = \$\ 72$ $6 \times \$\ 4 = \$\ 24$ \$261
3		4	4	$4 \times \$33 = \$132$ $4 \times \$24 = \$\ 96$ $3 \times \$\ 4 = \$\ 12$ \$240
4	9	4	3	$3 \times \$33 = \$\ 99$ $4 \times \$24 = \$\ 96$ $9 \times \$\ 4 = \$\ 36$ \$231

The instructor bought 3 soccer balls, 4 footballs, and 9 softballs.

5. The sum of the present ages of two sisters is 24. Six years ago Chris was twice as old as Tina. What are their present ages?

Guess	Chris' Age Six Years Ago	Tina's Age Six Years Ago	Test
1	6	3	$6 + 6 = 12$ $3 + 6 = \underline{9}$ 21
2	10	5	$10 + 6 = 16$ $5 + 6 = \underline{11}$ 27
3	12	6	$12 + 6 = 18$ $6 + 6 = \underline{12}$ 30
4	8	4	$8 + 6 = 14$ $4 + 6 = \underline{10}$ 24

Chris is 14 and Tina is 10.

FINDING AND APPLYING A PATTERN

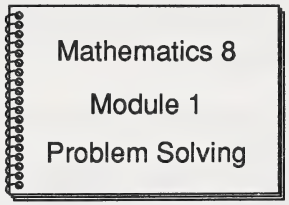
What Lies Ahead

In this section the student will learn these skills.

- making a simpler model of a complex problem in order to find a pattern
- applying the pattern to solve the problem

Gathering Materials

For this section the student will need these items.



(optional)

- *MATH WORKS: Problem Solving: Simplifying the Problem* (AIT)
- *SOLVE IT: Solving a Simpler Problem* (AIT)

(optional)

- *MATH STRATEGIES: Problem Solving* (SRA)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students check their answers to the Practice Activities and correct any errors.

Practice Activities

Computer Alternative

1. Calculator Practice

The computer program you will be using has a built-in calculator to help you do computations. The following exercise will show you how to use this built-in calculator.

You will be working at the computer, so take this booklet and Disk 1 of the *MATH STRATEGIES: Problem Solving* (SRA) with you. Run the disk and wait until you see the Chapter Menu on the screen.

Type "1." Press RETURN. Follow the directions on the screen until you see the following chart.

KEY:

Plus	+
Minus	–
Times	× or *
Divided by	/
Is equal to	RETURN

Notice that you may type either [×] or [*] for multiplication. Also, since there is no [÷] key, use the [/] key for division instead. You need to use the SHIFT key when typing [+] or [*].

Type "46 + 38." Press RETURN. Here's what should be on the screen:

46 + 38 = 84

On the next line, you'll see a ":" followed by a flashing "—." This is the signal that the calculator is ready for the next calculation.

Try holding the SHIFT key and press the [=] key. As you can see, the "=" sign is not used on this calculator. Whenever you're ready for the calculator to show the answer, press RETURN instead.

Type "876." Then press the [←] key once. The 6 is erased.

When you want to erase something you have typed, use the [←] key. (Note: Once you have pressed RETURN, you cannot erase what you have typed.)

To erase all the work that is on the screen, type "E". Try it.

If you want to type a 5-digit number, say 34 672, you will have to type "34672". The calculator will not accept spaces.

2. Spy Ring

Choose "Program 5 Using Models" from Disk 1 of the *MATH STRATEGIES: Solving Problems* (SRA) package. Then do the "Spy Ring Problem."

Note

When you see ":—" on the screen it means that you can use the built-in calculator to do calculations. After you have done the calculations, you must enter your answer and press RETURN.

Print Alternative

For Questions 3 to 5, you may act out the problems or draw diagrams in order to help you find the patterns. Apply the patterns to solve the problems.

3. There are eleven students attending a summer camp. If two students were introduced to each other at a time, how many introductions were made?

2. Computer corrected

3.

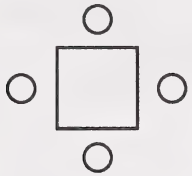
Number of Students	Number of Introductions	Pattern
1	0	
2	1	+1
3	3	+2
4	6	+3
5	10	+4
6	15	+5

+1 +1 +1 +1

55 introductions were made.

4. What is the largest number of sections into which a circle can be divided with ten straight lines?

5. One person can be seated on each of the four sides of a square table. If 14 square tables are arranged in one long row, how many people can be seated?



4.

Number of Lines	Number of Sections	Pattern
1	2	
2	4	+2
3	6	+2
4	8	+2
5	10	+2

A circle can be divided into 20 sections with ten lines.

5.

Number of Tables	Number of Seats	Pattern
1	4	
2	6	+2
3	8	+2
4	10	+2
5	12	+2

30 people can be seated if 14 tables are arranged in one long row.

SIMPLIFYING A PROBLEM

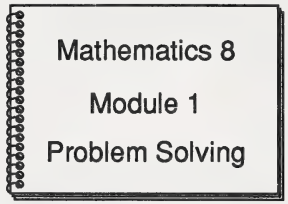
What Lies Ahead

In this section the student will learn these skills.

- using smaller numbers to solve a problem with large numbers
- breaking problems into steps

Gathering Materials

For this section the student will need these items.



(optional)

- *SOLVE IT: Solving a Simpler Problem* (AIT)
- *MATH WORKS: Simplifying the Problem* (AIT)

(optional)

- *MATH STRATEGIES: Solving Problems* (SRA)

Guiding the Student

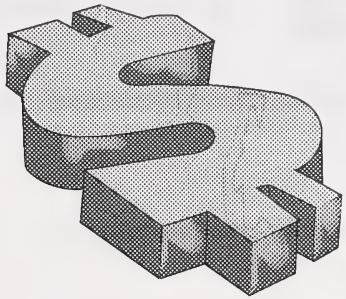
- Emphasize to the students the goal of this section.
- Help the students check their answers to the Practice Activities and correct any errors.

Practice Activities

For Questions 1 and 2, use simpler problems to help you solve the original problems. You can change the settings and the numbers, but do not change the operations.

1. The total Canadian national debt in 1977 was $29 585 900 000. In 1987 the national debt was $264 101 000 000. During this period of time, how much did Canada's national debt increase?

2. On December 31, 1986 there were 1 157 021 000 bills of Canadian paper money in circulation. Of these, 335 727 000 were one-dollar bills and 335 173 000 were twenty-dollar bills. How many bills were there of each of the other denominations (two-, five-, ten-, fifty-, hundred-, and thousand-dollar bills)?



Suggested Answers

1. In 1977 Shawn and Lisa owned 3 dogs. By 1987 they owned 20 dogs. In this period of time, how many new dogs did they get?

   $20 - 3 = 17$

   They got 17 new dogs.

   Use the same method to solve the original problem.

   $264\,101\,000\,000 - 29\,585\,900\,000 = 234\,101\,000\,000$

   The national debt increased by $234 101 000 000.

2. On December 31, 1986 there were 800 dogs in Barrhead. Of these, 70 were collies and 80 were poodles. How many dogs were there of each of the other breeds (German shepherd, beagle, etc)?

   $$\begin{array}{r} 70 \\ +\,80 \\ \hline 150 \end{array} \qquad \begin{array}{r} 800 \\ -\,150 \\ \hline 650 \end{array}$$

   There were 650 dogs of other breeds in Barrhead. Use the same method to solve the original problem.

   $$\begin{array}{r} 335\,727\,000 \\ +\,335\,173\,000 \\ \hline 670\,900\,000 \end{array} \qquad \begin{array}{r} 1\,157\,021\,000 \\ -\,670\,900\,000 \\ \hline 486\,121\,000 \end{array}$$

   There were 486 121 000 bills of other denominations in circulation.

Computer Alternative

3. Do "Lightning Strikes" from the *MATH STRATEGIES: Solving Problems* (SRA) package.

   You will need Disk 1. Start Disk 1. When the Chapter Menu comes on the screen, type "2" and press RETURN. You will then see the menu for Simplifying Problems.

   Type "1" for "Lightning Strikes" and press RETURN.

   Follow the instructions on the screen.

3. Computer corrected

4. Do "A Beautiful Dream" from *MATH STRATEGIES: Solving Problems* (SRA).

   Use Disk 2. From the Chapter Menu, choose "3 Problem Breakdown." Then, choose "2 A Beautiful Dream."

   Solve the problem at the computer.

4. Computer corrected

Print Alternative

In Questions 4 and 5 simplify the problems by doing them in steps.

5. The students in a Grade 8 class have a total of 51 pets. Five students have one pet each, eight students have three pets each, three students have none, and the rest have two pets each. How many students have exactly two pets?

6. Rohan charges $10 per hour to clear the neighbours' driveways. His father charges him $2 per hour for use of the snowblower. How much profit does Rohan make if he and a friend work 27 hours and they share the profits equally?

5. First find out how many pets are owned by the students who own one and three pets each.

$$\begin{aligned} 5 \text{ students} \times 1 \text{ pet each} &= 5 \text{ pets} \\ 8 \text{ students} \times 3 \text{ pets each} &= \underline{24 \text{ pets}} \\ &\quad 29 \text{ pets} \end{aligned}$$

To find out how many pets are owned by students who have two pets each, subtract the number of pets owned by students who have one and three pets each from the total number of pets.

$$51 - 29 = 22 \text{ pets}$$

To find how many students own the remaining 22 pets, divide the number of pets by 2, since each student owns 2 pets.

$$22 \div 2 = 11$$

Eleven students own two pets each.

6. Find out how much money is earned for working 27 hours.

$$\$10 \times 27 = \$270$$

Find out how much Rohan's father charges for using his snowblower for 27 hours.

$$\$2 \times 27 = \$54$$

To figure out total profit, subtract how much is owed to Rohan's father from how much money was earned in 27 hours.

$$\$270 - \$54 = \$216$$

Since Rohan and his friend split the profit, divide by 2.

$$\$216 \div 2 = \$108$$

Rohan makes $108.

WORKING BACKWARDS

What Lies Ahead

In this section the student will learn these skills.
- working backwards to solve problems
- using flow charts

Gathering Materials

For this section the students need these items.

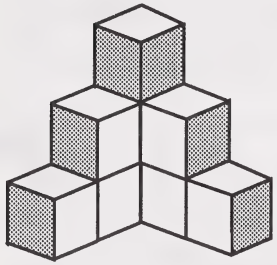
Mathematics 8
Module 1
Problem Solving

Guiding the Student

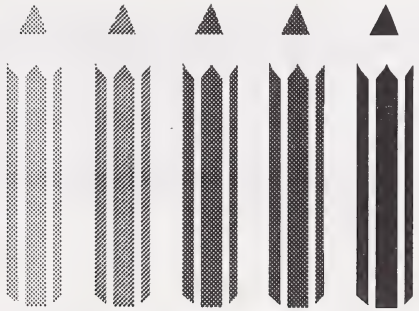
- Emphasize to the students the goal of this section.
- Help the students check their answers to the Practice Activities and correct any errors.

Practice Activities

1. Boxes can be stacked in a corner so that each layer has two less boxes than the layer below it, and the top layer has one box. How many boxes would be in the bottom layer if 36 boxes were stacked this way?

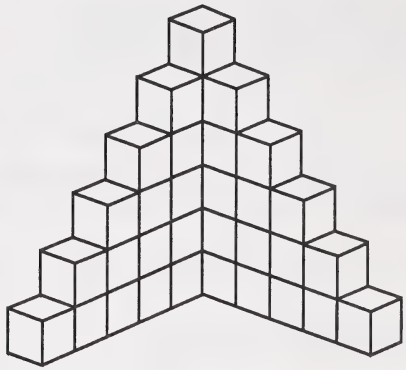


2. At the end of the school day, a teacher had 15 pencils left in her loan box. She remembered giving out 17 pencils in the morning and getting 11 back before noon, and then giving out 13 more pencils after lunch hour. How many pencils did she have at the beginning of the day?



Suggested Answers

1. Boxes are stacked from the bottom to the top. To solve the problem make a diagram beginning at the top and working down until 36 blocks have been stacked.



← 1 block

← 3 blocks

← 5 blocks

← 7 blocks

← 9 blocks

← 11 blocks

36 blocks

The top row has one block. Each consecutive lower row has two more blocks.

The bottom row has 11 blocks.

2. Working Forwards: ▒ − 17 + 11 − 13 = 15
Working Backwards: 15 + 13 − 11 + 17 = $\boxed{34}$

The teacher had 34 pencils at the beginning of the day.

3. Curly gave Larry and Moe as much money as each had. Then Larry gave Curly and Moe as much money as each had. Then Moe gave Curly and Larry as much money as each had. If each one now has $8, how much did each have at the beginning?

3. Work backwards. Use paper money and three people if necessary to act out the problem.

At the end Moe, Curly, and Larry have $8 each.

In the last step Moe gave Curly and Larry as much money as each had. In other words, he doubled their money. How much did Curly and Larry have before the last step?

Think $2 \times \square = 8$
$2 \times \boxed{4} = 8$

Curly and Larry each had $4 before the last step.

How much did Moe have before he gave away the money?

Think $\square - 2 \times 4 = 8$
$\boxed{16} - 8 = 8$

Moe had $16 before the last step.

In the middle step Larry gave Curly and Moe as much money as each had. In other words, he doubled their money. How much did Larry and Curly have before?

Think $2 \times \square = 4$ $\quad 2 \times \square = 16$
$2 \times \boxed{2} = 4$ $\quad 2 \times \boxed{8} = 16$

Curly had $2 and Moe had $8 before the middle step.

How much did Larry have before he gave away the money?
Think $\square - (2 + 8) = 4$
$\boxed{14} - 10 = 4$

Larry had $14 before the middle step.

In the first step Curly gave Larry and Moe as much as each had. In other words, he doubled their money. How much did Larry and Moe have at the beginning?

Think $2 \times \square = 14$ $2 \times \square = 8$
$2 \times \boxed{7} = 14$ $2 \times \boxed{4} = 8$

Larry had \$7 and Moe had \$4 at the beginning.

How much did Curly have at the beginning?

Think $\square - (7 + 4) = 2$
$\boxed{13} - 11 = 2$

Curly had \$13 at the beginning.

The steps can be shown in a table.

	at end	before last step	before middle step	at beginning
Moe	\$8	\$16	\$8	\$4
Larry	\$8	\$4	\$14	\$7
Curly	\$8	\$4	\$2	\$13

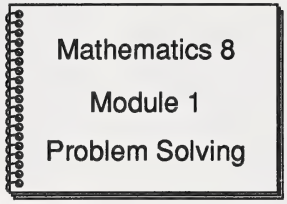
MORE THAN ONE WAY TO GO

What Lies Ahead

In this section the student will learn that there are many ways to solve one problem.

Gathering Materials

For this section the student will need these items.



THINKABOUT: There are Many Ways to Go (AIT)

(optional)

Problem Solving Strategies (MECC)

(optional)

Guiding the Student

- Emphasize to the students the goal of the section.
- Help the students check the answers to the Practice Activities and correct any errors.

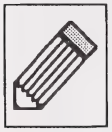
Practice Activities

Computer Alternative

1. Do the programs "Diagonals" and "Squares" in the *MECC: Problem Solving Strategies* package.

Print Alternative

For Questions 2 and 3 use two different methods to solve the problems.



2. How many rectangles are in this figure?

Suggested Answers

1. Computer corrected

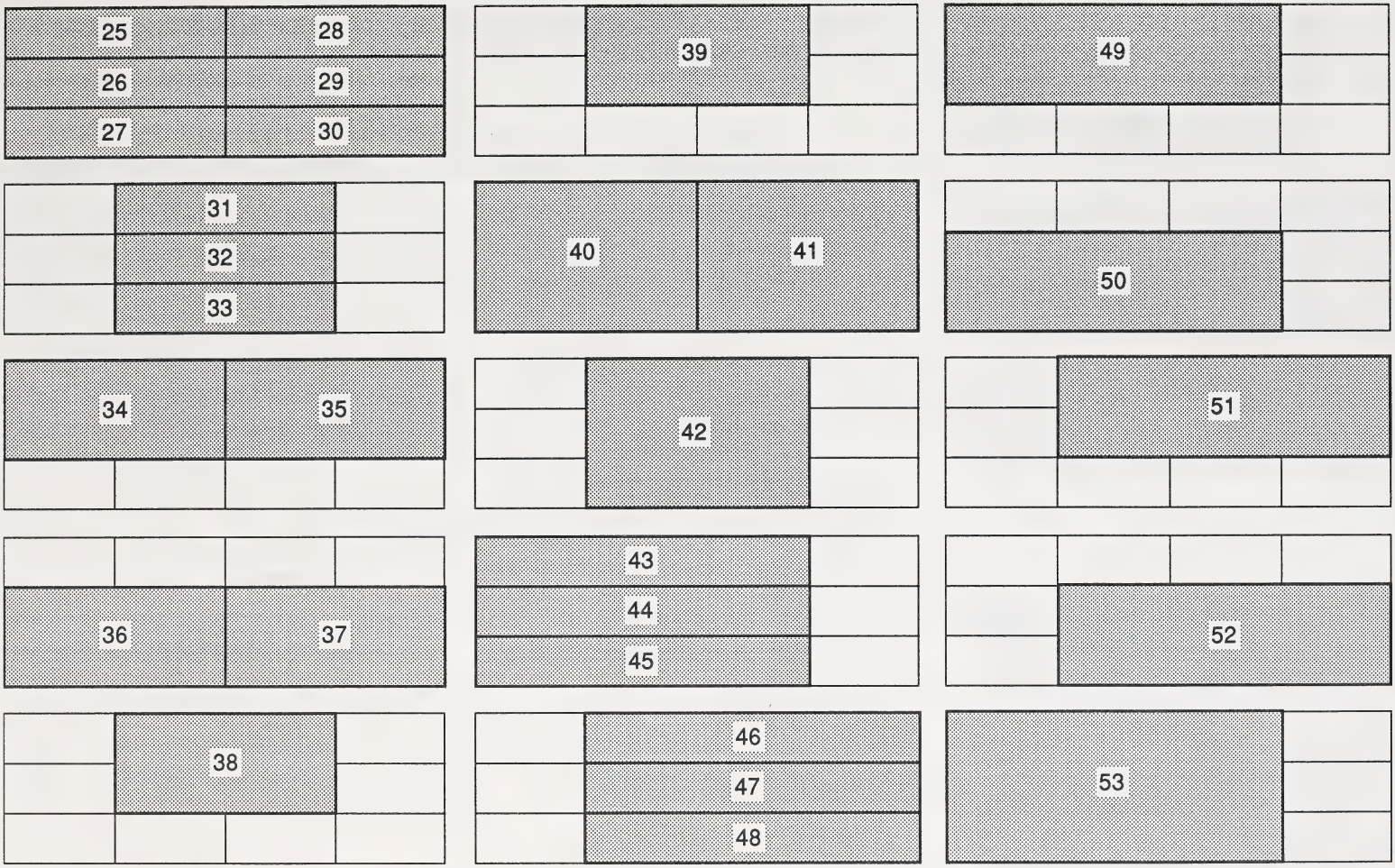
2. One method is to make an organized list of the rectangles.

1	4	7	10
2	5	8	11
3	6	9	12

13	14	15	16

17	18	19	20

21	22	23	24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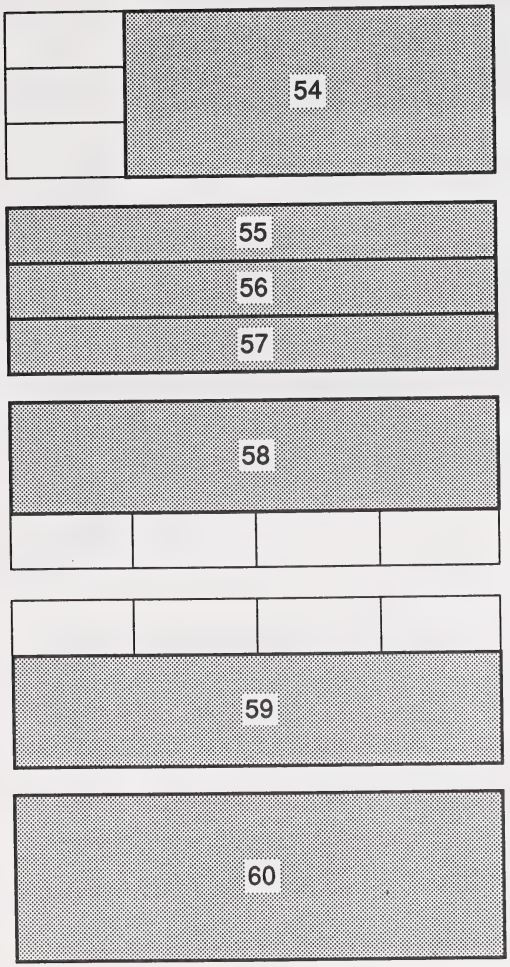
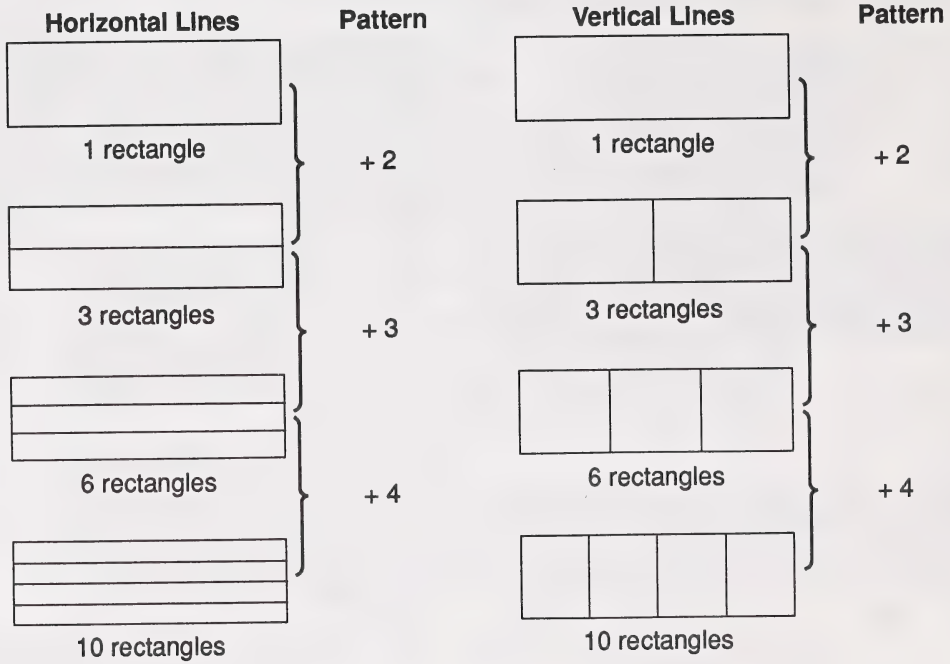
48
53

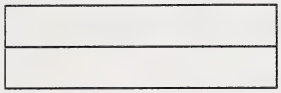
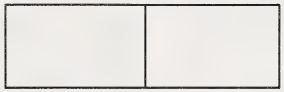
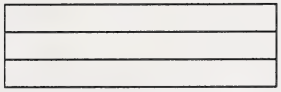
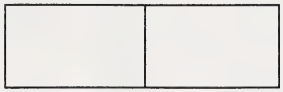
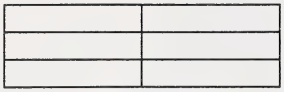
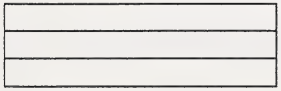
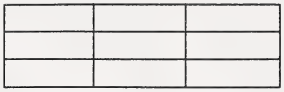
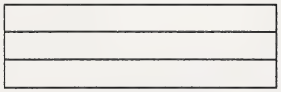
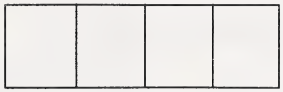
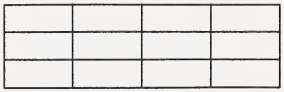


There are 60 rectangles altogether.

Another way to do 2.a. is to find a pattern. There is a pattern when lines are added to the original rectangle either horizontally or vertically.



Note there is a different pattern when lines are added in both directions.

Horizontal Lines	Vertical Lines	Lines in Both Directions	Pattern
 3 rectangles	 3 rectangles	9 rectangles	$3 \times 3 = 9$
 6 rectangles	 3 rectangles	 18 rectangles	$6 \times 3 = 18$
 6 rectangles	6 rectangles	 36 rectangles	$6 \times 6 = 36$
 6 rectangles	 10 rectangles	 60 rectangles	$6 \times 10 = 60$

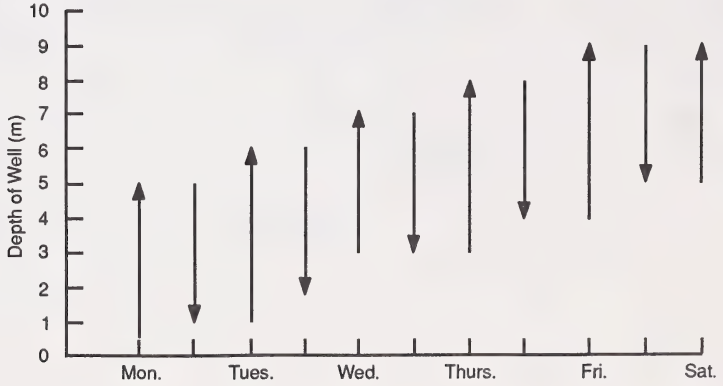
3. A well is 10 m deep. A salamander climbs up 5 m during the day and climbs down 4 m at night. If the salamander started at the bottom on Monday, on what day will it get to the top?

3. One way to solve this problem is to make a table.

	Day	Night
Monday	5 m	5 – 4 = 1 m
Tuesday	5 + 1 = 6 m	6 – 4 = 2 m
Wednesday	5 + 2 = 7 m	7 – 4 = 3 m
Thursday	5 + 3 = 8 m	8 – 4 = 4 m
Friday	5 + 4 = 9 m	9 – 4 = 5 m
Saturday	5 + 5 = 10 m reaches the top	

The salamander will reach the top on Saturday.

Another way to solve the problem is to make a diagram.



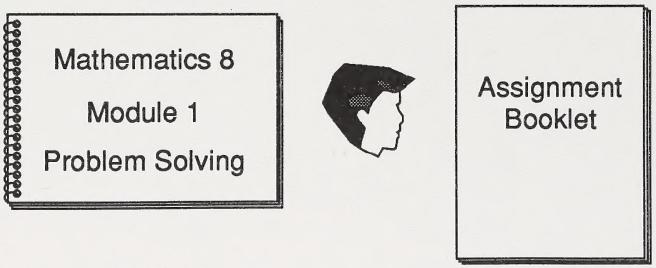
MODULE CONCLUSION

What Lies Ahead

The student is now ready to do the assignment in the assignment booklet. The student will be graded on the work done in this booklet.

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Students should complete the assignment independently.
- Provide each student with a grade and feedback to the assignment.
- Be sure to look for evidence of understanding the problem, developing and trying the plan, and looking back. Answers should be expressed in complete sentences, and the units should be included.

MATH 8

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